JPL IT Environment
and
IT Industry Trends
Viewed Through a JPL Filter

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"Plan for what is difficult while it is easy, do what is great while it is small." - Sun Tzu

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Agenda

- Introduce JPL's IT environment
- Discuss Industry IT Trends through JPL filter

Jet Propulsion Laboratory is part of NASA and Caltech

- Federally Funded Research and Development Center (FFRDC) Managed by Caltech for NASA

- NASA's lead center for robotic exploration of the solar system

- $1.7B contract per year, ~ 5,000 employees; 177 acre facility located in Pasadena, CA, with 670K sq.ft of office space and 900K sq.ft. of labs


- Manages worldwide Deep Space Network
  - 3 Locations - Goldstone CA, Madrid Spain, Canberra Australia
  - Spacecraft Command & Control - Recording scientific data

- 50+ years experience in spacecraft design, production and operation

- JPL spacecraft have visited all planets in our solar system except Pluto!

End-to-End Capabilities Needed to Implement Missions

Project Formulation - Team X

Mission Design

Mars Rovers

Large Structures - SRTM

Ion Engines

Ion Engine (DS-1)
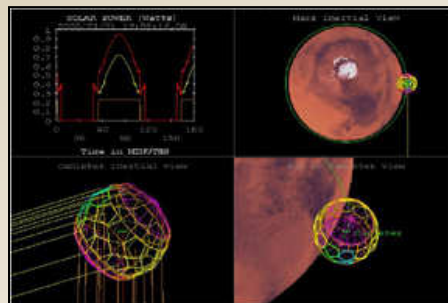
Mission Operations

Environmental Test

Integration and Test

Spacecraft Development

JPL operates nineteen spacecraft and seven instruments across the solar system… and beyond
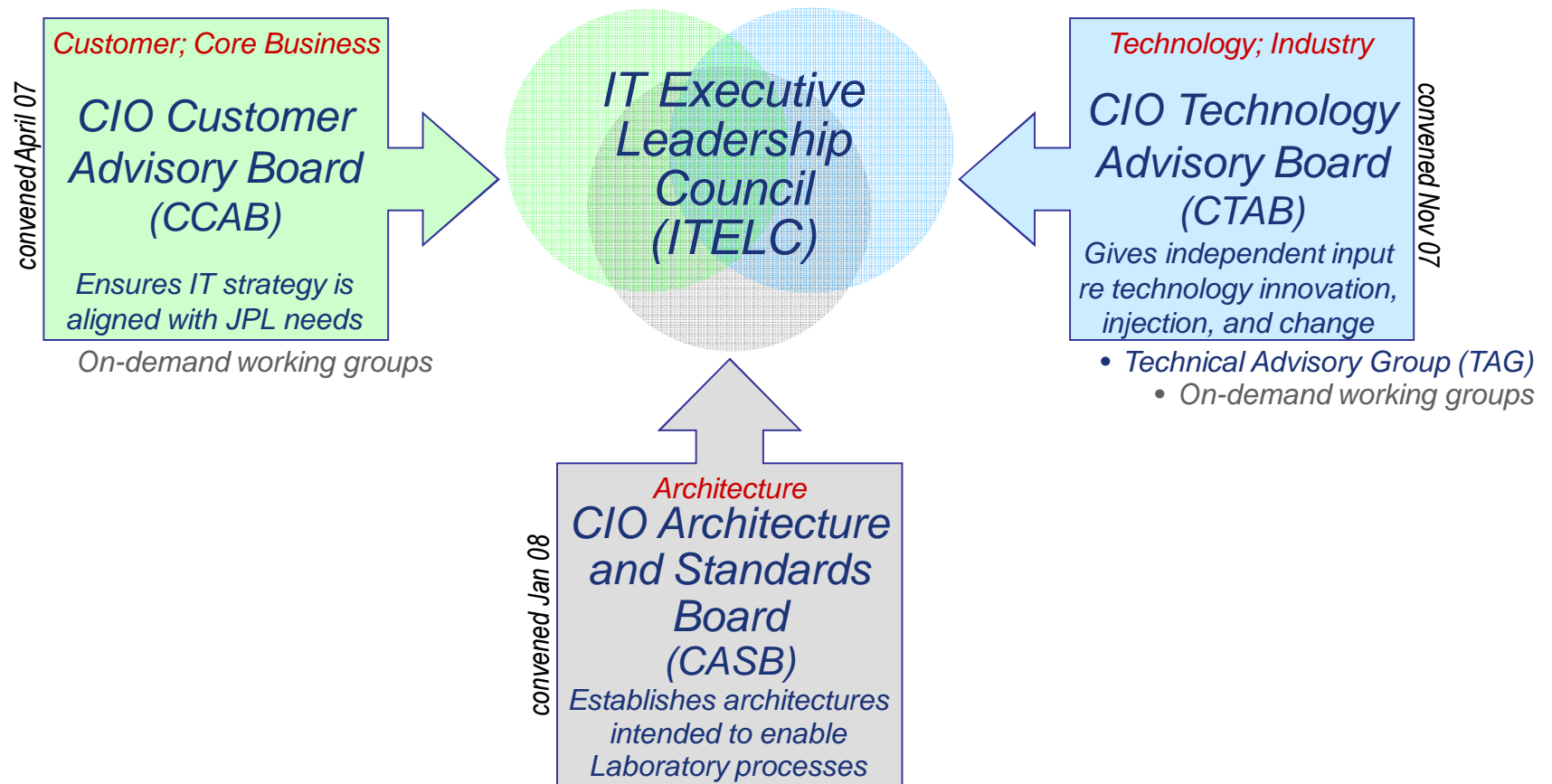
OCIO uses a collaborative governance process

OCIO Leadership Council

Jim Rinaldi
Chief Information Officer

Magalene Powell-Meeks
Associate Chief Information
Officer

Jay Brar
Chief Information Security
Officer

Cheryl deGyurky
OCIO Business
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Eric Nilson
IT Strategic Planning &
Portfolio Management
Office

Janet Zadeh
Customer Care &
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Tomas Soderstrom
Office of the IT Chief
Technology Officer

Gordon Campbell
IT Vendor Management
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Rick Hann
Human Resources
Information Systems

Vacant
Institutional Business
Systems

Melissa English
Project Control &
Enterprise Applications

Kevin Klenk
Enterprise Computing
& Networking

Peter Rinde
Institutional Business
Systems – Deputy

Elaine Zamani
Project Control &
Enterprise Applications -
Deputy

Photo not available

Stephen O'Hearn
Enterprise Computing
& Networking -
Deputy

8

Vision – *An enabling environment where everyone fully benefits from IT*

- Support JPL in meeting its goals
- Serve JPL's diverse IT needs
- Infuse right technologies at the right time
- Offer compelling service alternatives
- Be a responsive and transparent IT org
- Help JPL be cost-competitive

Environment – *Diverse needs and workforce drives heterogeneous IT*

- Collaborative, partners, face-to-face
- Workforce: >50% contractors (partners)
- Laptops: 65% PC, 34% Mac, 1% Linux
- PDAs: 49% BB, 49% iPhone, 2% Win
- Network ports: 17,000 + Wireless
- Exchange / SharePoint. VOIP is coming
- Rising: PartnerSpace, Research Network

Services – *Solid infrastructure and solutions-focused consulting*

- Desktop, phone, email, network, …
- Conference spaces
- Infrastructure and support to Missions
- Solutions Dev (Web, SW, mobile, apps)
- Engineering (PLM, CM, CAD, eMSA)
- Consulting to NASA
- Storage and computing capacity (+ HPC)
- Business and HR services

Current Priorities – *Short/long term mix*

- Working with partners
- Information re-use
- IT innovation and JPL business capture
- Recruitment and retention
- Built-in compliance
- Support effective Project estimates
- Data Center Strategy
- High Performance Computing Strategy
- Research Network rollout

Vision – *An enabling environment where everyone fully benefits from IT*

→ **Gives a competitive advantage to JPLers and JPL by listening and acting quickly**

Environment – *Diverse needs and workforce drives heterogeneous IT*

→ **Offers choices to give professionals the tools they need and want**

Services – *Solid infrastructure and solutions-focused consulting*

→ **Leverages the infrastructure and IT consulting skills to help build innovative solutions just-in-time**
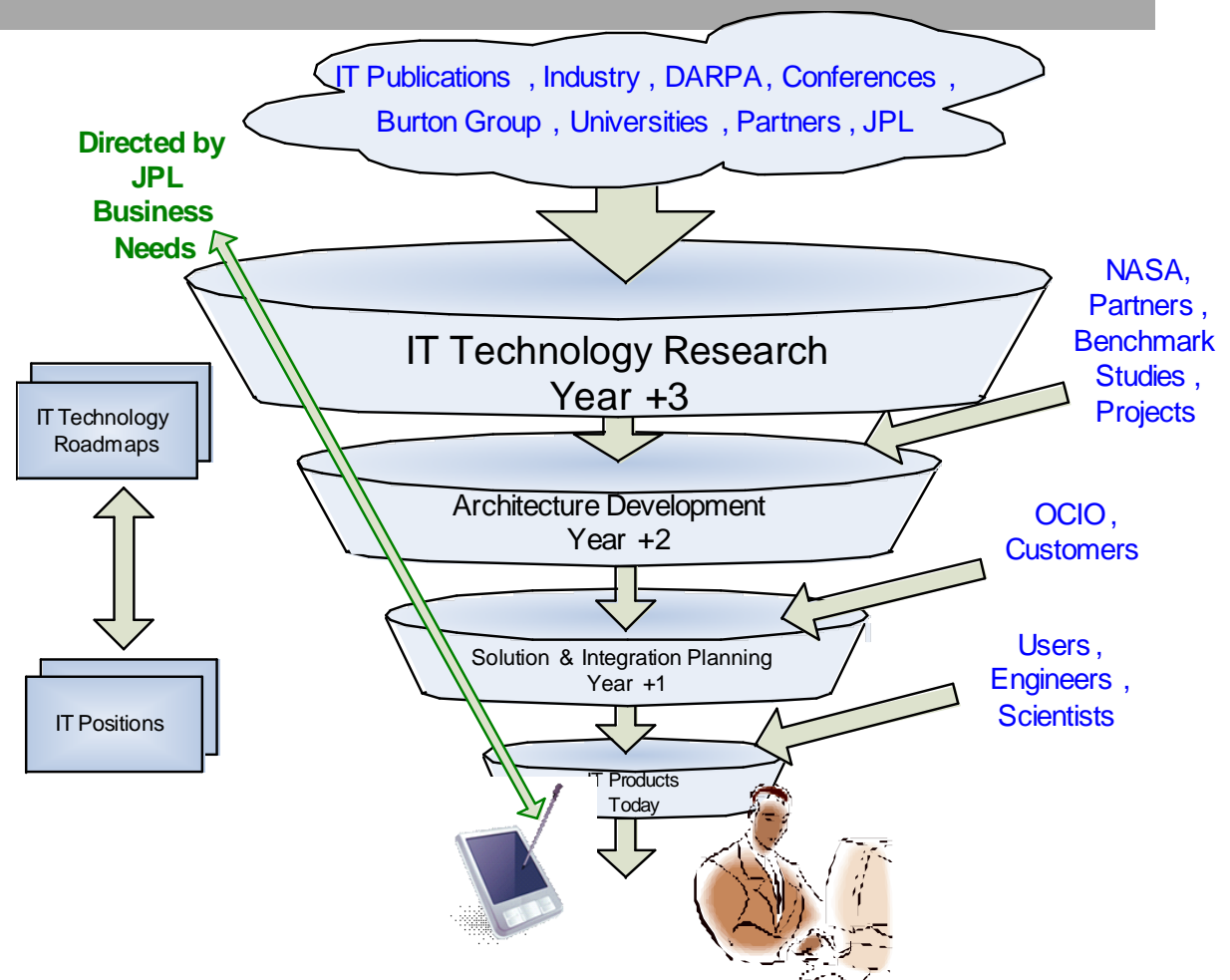
Current Priorities – *Short/long term mix*

→ **Combines industry partners and trends with JPL's business needs to help position JPL for the future**

IT Technology Road Mapping Is Focused On Our Business Needs

Principles

- **Identify IT trends**
- **Use Our filter**
- **Listen and share**
- **Collaboratively infuse**
- **Standardize and energize**
- **Use emerging COTS intelligently**
- **Stay compatible with NASA**

IT Publications , Industry , DARPA, Conferences , Burton Group , Universities , Partners , JPL

Directed by JPL Business Needs

IT Technology Roadmaps

IT Positions

IT Technology Research
Year +3

Architecture Development
Year +2

Solution & Integration Planning
Year +1

IT Products
Today

NASA, Partners , Benchmark Studies , Projects

OCIO , Customers

Users , Engineers , Scientists

Look at IT Trends From 3 Perspectives...

2. Enterprise

Methodology, Supportability, Compliance, Innovation

1. User
What,
When,
How

3. Technology

Access, Connectivity, Content, Computing, Security, Applications

... and look at What, Why, When, How, and Who for selected technologies

Here comes another bubble: www.youtube.com/watch?v=I6IQ_FOCE6I

We Analyzed and Researched Top IT Trends from Many Areas Including …

	Gartner Strategic IT Trends	Ziff Davis Enterprise IT Survey	Top Google 2007 Searches
Industry	Green IT Unified Communications Business Process Modeling Metadata Management Virtualization 2.0 Mashup & Composite Apps Web Platform & WOA Computing Fabric Real World Web Social Software	BI/data mining Collaboration and workflow Data & systems integration Business process mgt/model Virtualization Web services/SOA Disaster recvry, COOP, risk mgt Bandwidth/load/demand mgt CRM Corporate portals	Iphone webkinz tmz transformers youtube club penguin myspace heroes facebook anna nicole smith
Partners/Peers	**CSC Leading Edge** New Media Living in a New Reality Social Power InfoTransparency New Wave of Waves Platform Makeover Smarter Everything	**LM Mega Trends** Assemble Components New Sources of Ideas & Knowledge Unifying digital & physical worlds Network Virtual Worlds Innovation Driven By Consumers Virtualization 2.0 Increased demand & capacities	**Misc NASA/FFRDC/Other** Same as others +… Applied Web 2.0/3.0 Security and compliance Tap in to GenY Power Work from remote Supercomputing Governance

… (See backup for more details). We then took their top trends and mashed them into the top trends that will affect JPL resulting in…

The Top Industry IT Trends
Focused to JPL's Needs

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Gartner Strategic IT Trends	Ziff Davis Enterprise IT Survey	Top Google 2007 Searches
Green IT (3)	BI/data mining (2,4)	Iphone (1,5,6,7) webkinz

Industry

Unified
Busine
Metada
Virtuali
Mashup
Web Pl
Compu
Real W
Social S

Partners/Peers

CSC Le
New Me
Living in
(1,6,7)
Social F
InfoTra
New Wa
Platform
Smarter

Top IT Trends that will affect JPL:

1. Extreme Collaboration
2. Cloud Computing
3. **Go Green**
4. Cyber Security
5. Consumerization
6. More Resources
7. Develop Differently

(1) Extreme Collaboration; (2) Virtualize Everything;   (3) We're Going Green;
(4) Self-defending Enterprise; (5) Consumerization of IT; (6) I Want More! (7) Develop Differently

1. Extreme Collaboration

Digital Nomad

- Increased collaboration between individuals and companies
- Employees become **Digital Nomads**… affecting everything
- Companies partner more and develop a few **Super Partners**
- All keep in touch via increased **Social Networking** (Web 2.0)
  … and finally get assistance from the **Semantic Web** (Web 3.0) increasing productivity especially from new generation
- Travel decreases… because we are productive via **Telepresence** and shared data, displays, and environments
- **Virtual Environments** become useful… especially inside the FWs
- **Mixing of virtual and physical worlds**.. improving both


Extranet

Virtual Environments

Telepresence

2. Cloud Computing

Virtualization

- **Consolidation and virtualization** of servers, storage, and services
- **Extended data center** – both inside and outside the enterprise and beyond (e.g. Amazon S3 service)
- **Service Oriented Architecture** and **Web Services** tie all the services together seamlessly inside and outside the enterprise
- **Cloud Computing** becomes a familiar buzzword (e.g. Amazon EC2)

http://www.youtube.com/watch?v=uOQcjvUHZ0k

Service Oriented Arch. (SOA)
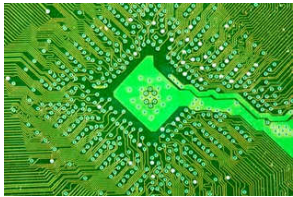
3. We're Going Green

Multicore

- Seen to help the enterprise, the country, the world
- Changes how we select and measure technology including purchases, **source selection**, **compliance**
- New services and partnership emerge
- Measured with **"Green Dashboards"**
- Implemented via new technology, best practices, **Web 2.0**
- Drive to extend beyond the 2% solution

Green Dashboard

Green life cycle

17

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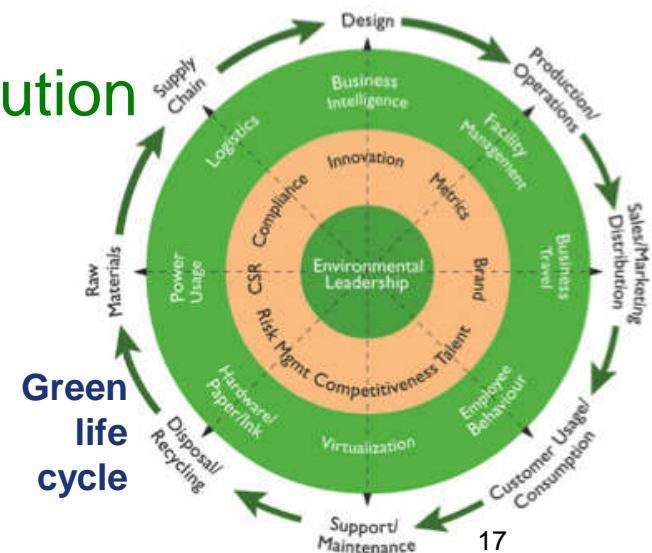
4. Cyber Security

Cyber Security

- Security increases in priority
  - Built-in **CyberSecurity** with centralized specialists reacting with lightning speed to international hacking
  - **Application security** focus driven by Web 2.0/3.0
  - **Encryption** of mobile devices
 - Enabling **secure communications** with our partners

5. Consumerization of IT

New PDAs

- **Increased personal stake** in devices and capabilities
- **Mobile improvements** – hardware, software, bandwidth
- **We all pick** - everyone gets involved with technology evaluation and selection and innovation
- **Open Source** (such as Linux) is going mainstream and becomes embedded in in commercial software
- Examples: **3D printing** becomes affordable; many carry **only a PDA**; **always connected**; **never lost** again

From Computer Desktop Encyclopedia
© 2007 The Computer Language Company Inc.

3D Printing 19
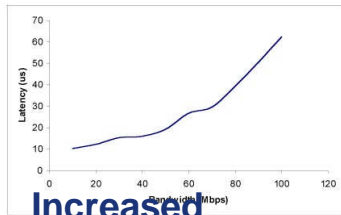
6. More Resources

Increased demand

- **Drastically increased demands** on networking, storage, and computing capabilities
- **Wireless everywhere**
  - New wireless spectrum allocations
  - WiMax vs. WiFi battle for wireless supremacy
- **Self-publishing** video capability
- **eLearning** on demand (fast via video)
- **Smaller, more powerful devices**

JPLTube 20
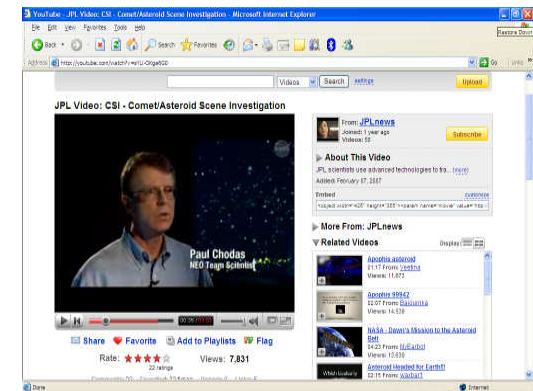
7. Develop Differently

- **Enterprise Mashups** enable new capabilities developed at Internet speed… new skills needed
- **Rich Mobile Applications** explosion, confusion, then standardization and consolidation
- **Cross-enterprise applications** are enabled via Enterprise Architecture, Service Oriented Architecture, and **intelligent agents**
- Increase in **Social Networking** and **Semantic Web** applications and **reusable widgets**
- Internet becomes the operating system with Web **widget/tool standardization**
- **Google** leads the way

Mashup Innovation

Example of new Technologies in a Flight Mission (Phoenix)

Remote Face-to-Face Concept Validation for Phoenix Project

1st pix from Phoenix

Phoenix landing in Second Life in real time

"(About 3 hours ago from web in reply to KeithCowing) - Looking forward to moving arm today. Will bend the wrist and flex the elbow. It's been stowed for 10 months so I'll move it slowly…"

Blog

Landing Day 05.25.08
Brent Shockley 7:20 pm
I'm happy to report that we now have pictures from the spacecraft, downlinked through Mars Odyssey…

Evaluated useful technologies quickly to modernize, reduce bureaucracy, and save cost

- **Approach:** Innovations evaluated quickly by key stakeholders
- **Flow:** Identify → Proof of Concept → Pilot → Production
- **Results:** JPL was quick to pilot and adopt:
  - Remote Face-to-Face system (quality, affordable, portable)
  - iPhone (1 year)
  - MacAir (1 month)
  - Blackberry Storm (2 weeks)
  - PartnerSpace capability
  - Social Networking (Wikis, FaceBook, Linked-In, Twitter, YouTube, …)
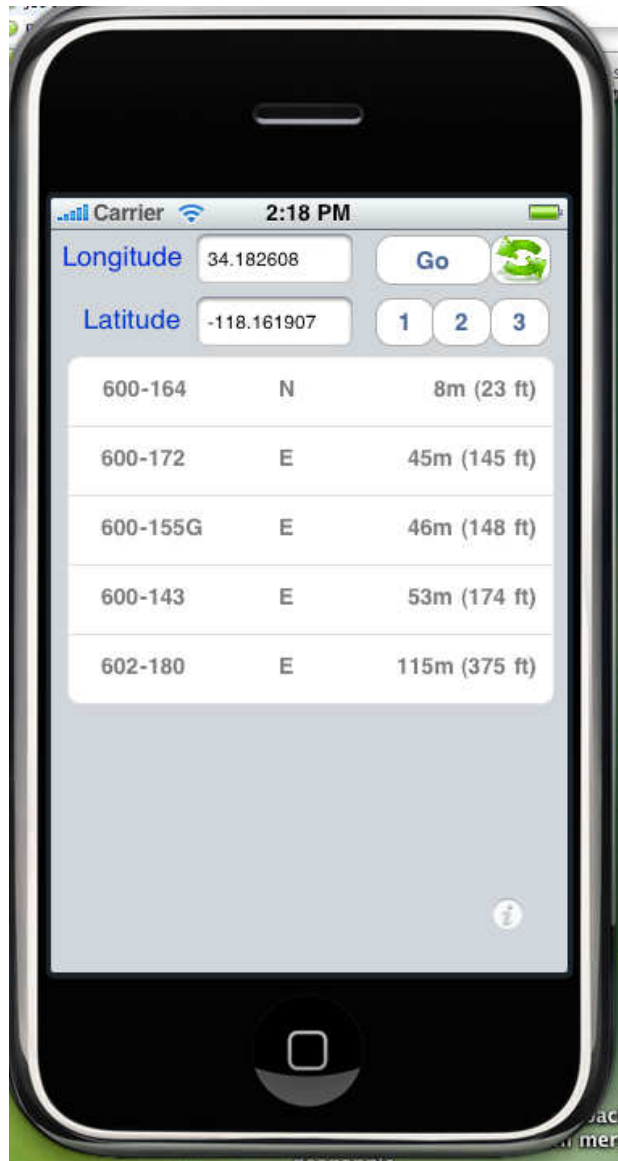 - Virtual NASA Center (Explorer Island in Second Life)

Example: Nearest conference room application

Longitude	34.182608	Go
Latitude	-118.161907	1	2	3
600-164	N	8m (23 ft)
600-172	E	45m (145 ft)
600-155G	E	46m (148 ft)
600-143	E	53m (174 ft)
602-180	E	115m (375 ft)

Process: Determine location, Calculate distance of rooms nearby, display data

- Can integrate with UMS (e-mail, calendar, contacts)
- Supports VPN, with some minor configuration changes
- Can develop JPL Specific apps for business/science/outreach

"It took me like a day to do this"

Jeremy Arca
Sec 172

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IT Trends	Recent and Upcoming IT initiatives
1. Extreme Collaboration	Video Conferencing (HD and Desktop), Confluence Wiki, Super Partnering, Virtual Worlds (2nd Life and 3DInternet), Collaboration Spaces (PartnerSpace, TeamSpace, ProposalSpace), New Voice Mail, Social Networking, VOIP, UMS), Content Management WG, PDM Data Interchange
2. Cloud Computing	Cloud Computing (overall, Public Cloud, Community Cloud, Private Cloud, GRID, Virtual Desktop), SOA, REST, *Consolidation, Virtualization)*
3. Go Green	Green Dashboards, *Energy savings*, new partnering
4. Cyber Security	Cyber Security, *Encryption, Web app* security training/planning/response
5. Consumerization	CES 2009, Technology Petting Zoo, ITLabs, iPhone adoption, BB Storm adoption, Rich Mobile Computing, specific evaluations, Open Source
6. More Resources	JPLTube, wireless input
7. Dev. Differently	REST, Mashups, Semantic Web WG